CLAIMS

1. A method for measuring the potential of a voltage source in a measured circuit having an impedance in the measured circuit, the method comprising:

(a) measuring a first potential by connecting a voltage measuring circuit, having a first input impedance, across the measured circuit and recording the first potential;

(b) changing the input impedance of the voltage measuring circuit;

(c) measuring a second potential with the voltage measuring circuit connected across the measured circuit, the voltage measuring circuit having the second input impedance and recording the second potential; and

(d) solving simultaneous equations, describing the connected measured and voltage measuring circuits, for the potential of the voltage source.

2. A method in accordance with claim 1 wherein the input impedance is changed by switching a resistive circuit element from one state to a second state, the states being connected in the measuring circuit and disconnected from the measuring circuit.

3. A method in accordance with claim 1 wherein at least an additional measurement is made for at least one additional input impedance.

4. A method in accordance with claim 1 where the simultaneous equations solved are:

$$\left.\begin{aligned} V'_M &= V_A \times \left(\frac{R'_{INPUT}}{R'_{INPUT} + R_{CIRCUIT}} \right) \\ V''_M &= V_A \times \left(\frac{R''_{INPUT}}{R''_{INPUT} + R_{CIRCUIT}} \right) \end{aligned}\right\}$$

wherein

V'_M is the measured voltage at the first measured impedance

V''_M is the measured voltage at the second measured impedance

V_A – actual (true) voltage

R'_{INPUT} is the first input impedance of the measurement device

R''_{INPUT} is the second input impedance of the measurement device

$R_{CIRCUIT}$ – resistance of the measured circuit

5. A method in accordance with claim 4 wherein the input impedance is changed by switching a resistive circuit element from one state to a second state, the states being connected in the measuring circuit and disconnected from the measuring circuit.

6. A method in accordance with claims 1 or 2 or 3 or 4 or 5 wherein the circuit being measured includes a metal object buried in soil and a reference electrode in contact with the soil and wherein the voltage measuring circuit is electrically connected between the metal object and the reference electrode.

7. An apparatus for measuring the potential of a voltage source in a measured circuit having an impedance in the measured circuit, the apparatus comprising:

(a) a voltage measuring circuit having an input impedance;

(b) a switchable impedance network in the voltage measuring circuit for varying the input impedance to a plurality of input impedance values;

(c) a microcontroller connected to the voltage measuring circuit for switching the input impedance, for recording measured potentials at a plurality of input impedances, for solving simultaneous equations, the equations describing the connected measured and voltage measuring circuits, for the potential of the voltage source, and for outputting a signal representing the potential of the voltage source.

8. An apparatus in accordance with claim 7 wherein the switchable impedance network comprises a plurality of resistors at least one of the resistors being connected to a switch for switching said one resistor alternatively in and out of the circuit.

9. An apparatus in accordance with claim 8 wherein the switchable impedance network comprises a plurality of resistors, each resistor connected to a switch and being alternatively switchable into the circuit.

10. An apparatus in accordance with claim 7 or 8 or 9 wherein the microcontroller is programmed to solve equations which are substantially:

$$\left.\begin{aligned} V'_M &= V_A \times \left(\frac{R'_{INPUT}}{R'_{INPUT} + R_{CIRCUIT}} \right) \\ V''_M &= V_A \times \left(\frac{R''_{INPUT}}{R''_{INPUT} + R_{CIRCUIT}} \right) \end{aligned}\right\}$$

wherein

V'_M is the measured voltage at the first measured impedance

V''_M is the measured voltage at the second measured impedance

V_A – actual (true) voltage

R'_{INPUT} is the first input impedance of the measurement device

R''_{INPUT} is the second input impedance of the measurement device

$R_{CIRCUIT}$ – resistance of the measured circuit